Find the magnitude of the following vectors:

i) $\hat{i} + \hat{j} + \hat{k}$ ii) $2\hat{i} - 3\hat{j} - 7\hat{k}$

let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$

$$|\vec{a}| = \sqrt{(1)^2 + (1)^2 + (1)^2}$$

$$= \sqrt{1+1+1} = 3$$

(ii) $2\hat{i} - 3\hat{j} - 7\hat{k}$

$$\vec{a} = 2\hat{i} - 3\hat{j} - 7\hat{k}$$

$$|\vec{a}| = \sqrt{(2)^2 + (-3)^2 + (-7)^2}$$

$$= \sqrt{4+9+49} = \sqrt{62}$$ Ans

Find the sum of the vectors $\vec{a} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$, $\vec{b} = -2\hat{\imath} + 4\hat{\jmath} + 5\hat{k}$ and $\vec{c} = \hat{\imath} - 6\hat{\jmath} - 7\hat{k}$.

$$\vec{a}+\vec{b}+\vec{c} = (\hat{\imath}-2\hat{\jmath}+\hat{k})+(-2\hat{\imath}+4\hat{\jmath}+5\hat{k})+(\hat{\imath}-6\hat{\jmath}-7\hat{k})$$

$$= (\hat{\imath}-2\hat{\imath}+\hat{\imath})+(-2\hat{\jmath}+4\hat{\jmath}-6\hat{\jmath})+(\hat{k}+5\hat{k}-7\hat{k})$$

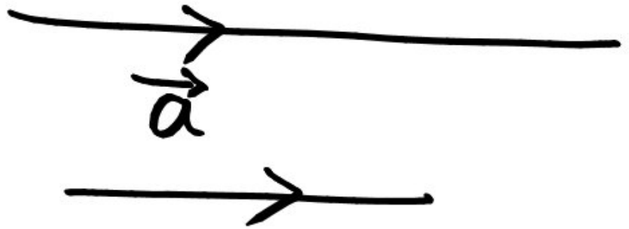
$$\boxed{\vec{a}+\vec{b}+\vec{c} = 0\hat{\imath}-4\hat{\jmath}-\hat{k}}$$

Find a unit vector in the direction of the vector $\vec{a} = 2\hat{\imath} - 3\hat{\jmath}$

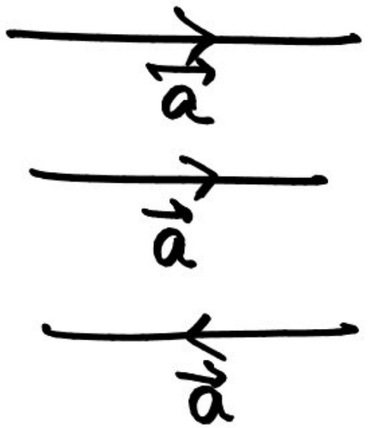
$\vec{a} = 2\hat{i} - 3\hat{j}$

$\hat{a} = \dfrac{\vec{a}}{|\vec{a}|}$

$$\hat{a} = \frac{2\hat{i} - 3\hat{j}}{\sqrt{4+9}} = \frac{2\hat{i} - 3\hat{j}}{\sqrt{13}}$$



Parall.



$\pm$

Write a Unit vector in the direction of sum of vectors $\vec{a} = 2\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ and $2\hat{\imath} + j - 7\hat{k}$

$$\vec{a} = 2\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$$

$$\vec{b} = 2\hat{\imath} + \hat{\jmath} - 7\hat{k}$$

$$\hat{a} = \frac{\vec{a}}{|\vec{a}|}$$

$$\vec{a} + \vec{b} = 4\hat{\imath} + 3\hat{\jmath} - 12\hat{k}$$

$$\hat{\vec{a} + \vec{b}} = \frac{(\vec{a} + \vec{b})}{|\vec{a} + \vec{b}|}$$

$$= \frac{4\hat{\imath} + 3\hat{\jmath} - 12\hat{k}}{\sqrt{16 + 9 + 144}} = \frac{4\hat{\imath} + 3\hat{\jmath} - 12\hat{k}}{\sqrt{169}} = \boxed{\frac{4\hat{\imath} + 3\hat{\jmath} - 12\hat{k}}{13}}$$

If $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - 2\hat{k}$ find the unit vector in the direction of $2\vec{a} - \vec{b}$

$$2\vec{a} - \vec{b} = 2(\hat{i} + \hat{j} + 2\hat{k}) - (2\hat{i} + \hat{j} - 2\hat{k})$$

$$= 2\hat{i} + 2\hat{j} + 4\hat{k} - 2\hat{i} - \hat{j} + 2\hat{k}$$

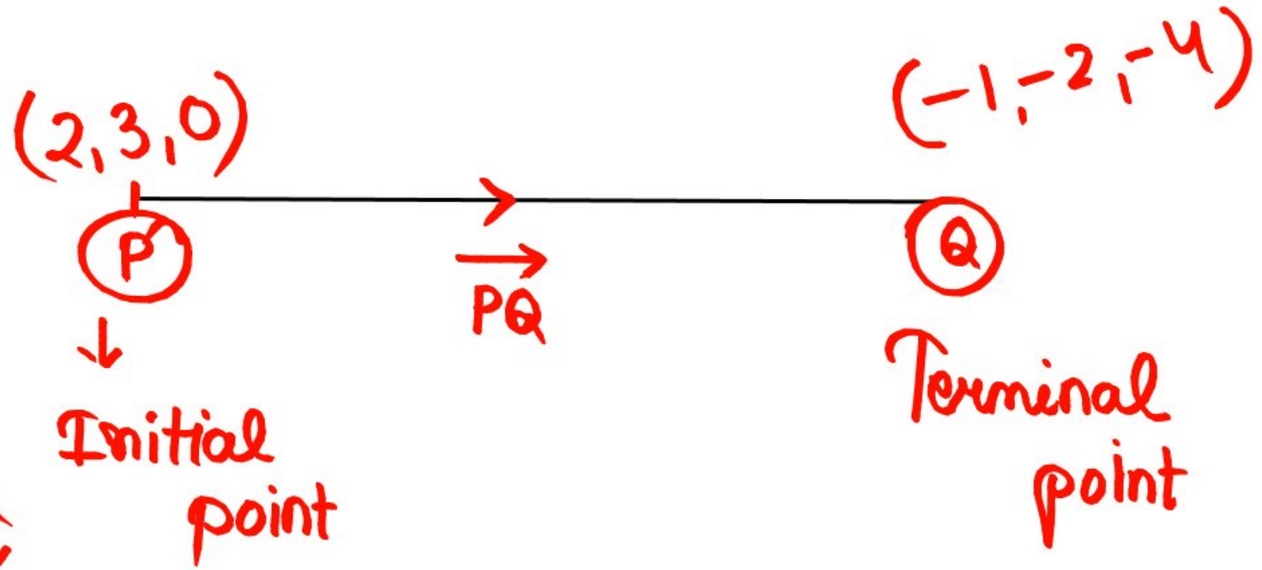
$$= 0\hat{i} + \hat{j} + 6\hat{k}$$

$$\text{Unit Vector} = \frac{\hat{j} + 6\hat{k}}{\sqrt{(1)^2 + (6)^2}} = \frac{\hat{j} + 6\hat{k}}{\sqrt{37}} \quad \text{Ans}$$

12. i) Find the vector with initial point p(2,3,0) and terminal point Q (-1,-2,-4).Also find its magnitude.

$\vec{OP} = 2\hat{i} + 3\hat{j} + 0\hat{k}$

$\vec{OQ} = -\hat{i} - 2\hat{j} - 4\hat{k}$



$\vec{PQ} = \vec{OQ} - \vec{OP}$

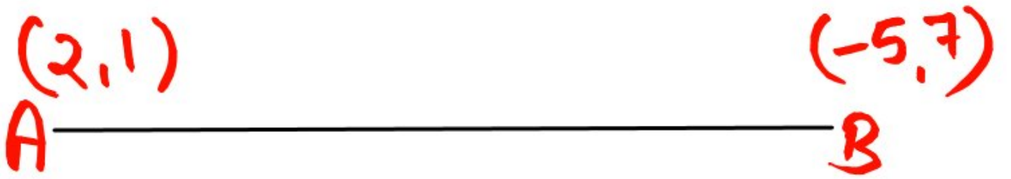
$= -\hat{i} - 2\hat{j} - 4\hat{k} - 2\hat{i} - 3\hat{j} - 0\hat{k}$

$\vec{PQ} = -3\hat{i} - 5\hat{j} - 4\hat{k}$

$|\vec{PQ}| = \sqrt{(-3)^2 + (-5)^2 + (4)^2}$

$= \sqrt{9 + 25 + 16} = \sqrt{50} = 5\sqrt{2}$

ii) Write the scalar components of the vector $\overrightarrow{AB}$ with initial point A(2,1) and terminal point B(-5,7).



$\overrightarrow{OA} = 2\hat{i} + \hat{j}$

$\overrightarrow{OB} = -5\hat{i} + 7\hat{j}$

$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA}$

$= -5\hat{i} + 7\hat{j} - 2\hat{i} - \hat{j}$

$\overrightarrow{AB} = -7\hat{i} + 6\hat{j}$

Scalar Component $(-7, 6)$

iii) Find the terminal point of the vector $\overrightarrow{PQ}$ whose initial point is P(-2,5,0) and components along coordinate axes are 2,-3 and 7 respectively.

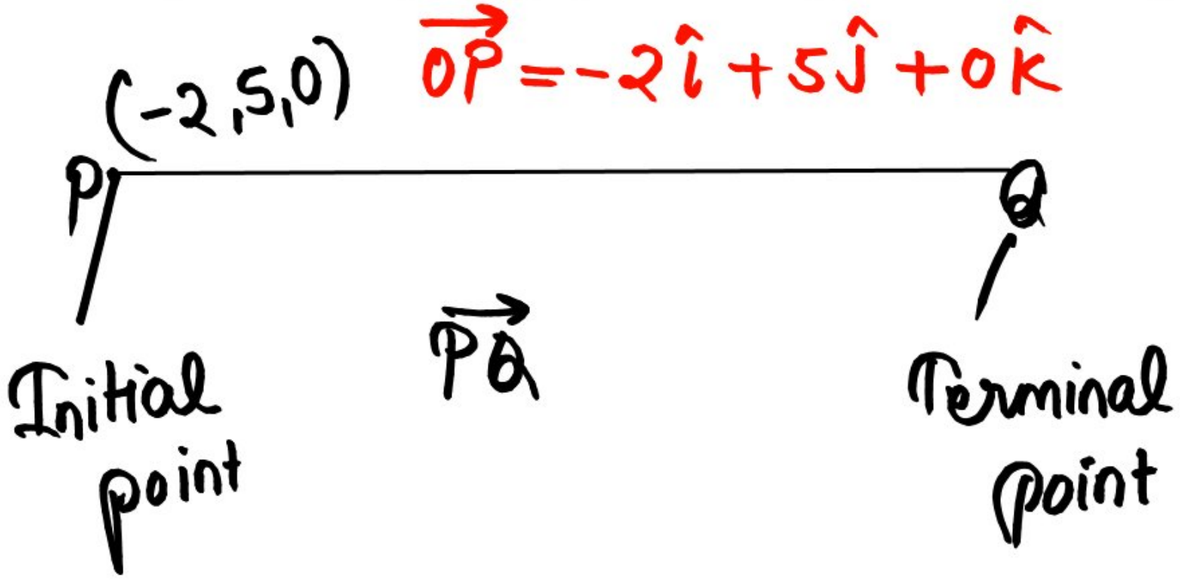
$$\overrightarrow{PQ} = \overrightarrow{OQ} - \overrightarrow{OP}$$

$$\overrightarrow{PQ} + \overrightarrow{OP} = \overrightarrow{OQ}$$

$$\overrightarrow{OQ} = 2\hat{i} - 3\hat{j} + 7\hat{k} + (-2\hat{i} + 5\hat{j} + 0\hat{k})$$

$$\boxed{\overrightarrow{OQ} = 0\hat{i} + 2\hat{j} + 7\hat{k}}$$

$$Q(0,2,7)$$



$$\overrightarrow{PQ} = 2\hat{i} - 3\hat{j} + 7\hat{k}$$